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CONTENTS:

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THE NEW ENGLAND BOTANICAL CLUB

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THE OSCILLATORIACEAE OF SOUTHERN MASSACHUSETTS[1]

FRANCIS DROUET

ALGAL works published during the past sixty-five years contain short lists of Oscillatoriaceae from southern Massachusetts,[2] the chief among which are those of Farlow, *Marine Algae of New England* (1891); Collins, RHODORA **2**: 41–52 (1900); Davis, Bull. U. S. Bur. Fish. 1911 (2): 795–833 (1913); Taylor and Hazen in Lewis, RHODORA **26**: 211–215 (1924); and Croasdale, *Fresh Water Algae of Woods Hole, Massachusetts* (1935). Other shorter papers are referred to in the list of species below. A small number of preserved specimens from the region has been distributed by Farlow, Anderson & Eaton in *Algae Am. Bor. Exsiccatae* and by Collins, Holden & Setchell in *Phycotheca Boreali-Americana.* These exsiccatae, the specimens upon which previous reports have been based, and other material cited in the present paper have come chiefly from the vicinity of Woods Hole. The freshwater algal habitats of this area are described by Fogg, RHODORA **32**: 147ff (1930), and by Croasdale, ibid.; the marine and brackish habitats by Davis, ibid. 1911 (1): 443–544 (1913), and by Taylor, *Marine Algae* (1937).

The comparative morphology of the group, first treated critically by Thuret, Ann. Sci. nat. VI Bot. **1**: 372–382 (1875), and further elaborated in a series of papers by Bornet, Thuret, Flahault, and Gomont, is summarized in a lucid manner in the introduction to

[1] Contribution from the Osborn Botanical Laboratory of Yale University and the Department of Botany, Marine Biological Laboratory.

[2] The Myxophyceae of Nantucket County will be treated in a separate publication and are therefore not referred to in the present paper. For a similar reason, the genus *Plectonema* Thur. ex Gom. is omitted here.

Gomont's 'Monographie des Oscillariées,'[1] Ann. Sci. nat. VII Bot. **15**: 263–368; **16**: 91–264 (1892). Recent work is reviewed by Geitler, Rabenh. Kryptogamen-Fl. **14** (1930–32). These authors make clear, among other things, that most species can be recognized with reasonable accuracy only when the organisms are found in non-hormogonial masses of considerable size and relatively pure state. Such determinable plant-masses, it is argued, develop only under certain limited combinations of physical, chemical, and biotic conditions; as these conditions change, the plant-mass may pass into the hormogonial state or disappear entirely. The determinable state may persist for a single day, or throughout a season, or even longer. The descriptions for taxonomic purposes will apply, therefore, only to the brief period of the life history during which the plant-mass is not in the hormogonial or dispersed states. In the species which he treated, Gomont attempted to define the limits of variation of each character during this determinable state: color and form of plant mass; color, diffluence, lamination, size, and reaction to chlor-zinc-iodine of the sheath; habit of the filaments and trichomes; shapes of apices of the trichomes; the degree of thickening of the outer wall of the apical cell; cell measurements; color and granulation of the protoplasm; and nature of the cross-walls. The recent literature contains frequent expressions of doubt as to the taxonomic importance of certain of the more variable characters referred to above. Such doubt in some cases may be well founded; in other cases it may be due to the lack of familiarity with the species concerned. It is to be regretted that these limits of variability have not yet been studied by pure culture methods; on the other hand, though such characters are generally regarded as extremely inconstant in other groups of plants and animals, I must confess myself unable except in rare instances to enlarge upon the limits of variability as described by Gomont.

For permanent preservation of the characters mentioned above, drying the material as quickly as possible without the aid of heat is recommended. The best preparations are secured when the material is reduced to the dried condition in the open air (in front of a shaded open window or electric fan) within an hour after it has been lifted from its habitat. In so drying, the shapes of the cells and even the protoplasmic characters of color and granulation are preserved.

[1] The International Botanical Congress of Vienna in 1905 established Gomont's 'Monographie' as the point of departure for nomenclature in the Homocystineae.

Mounts duplicated upon mica (or glass) and paper are to be preferred. Formalin, even in such low concentrations as 2% by volume in water, often produces granules and vacuoles not evident in the living protoplasm and seldom allows the original color of the plant mass or of the trichomes to be retained. If material preserved in formalin is dried in the preparation of herbarium specimens, such essential characters as size and shapes of cells are often sacrificed also, especially in the unsheathed forms. There are indications that preservation in liquid media affects the capacity of the sheath to react with chlorzinc-iodine. Preserving fluids containing alcohol, acetic acid, glycerine, and salts of copper render most material valueless for taxonomic purposes.

For obvious reasons, citations of specimens in the list below have been restricted to herbarium material. The location of specimens in herbaria is indicated by means of the following abbreviations: D, my personal herbarium; F, Farlow Herbarium of Harvard University; Mo, Herbarium of the Missouri Botanical Garden; N, New York Botanical Garden; P, Herbarium of the University of Pennsylvania; S, Naturhistoriska Riksmuseet, Stockholm; T, Herbarium of Wm. Randolph Taylor; W, Herbarium of the Marine Biological Laboratory; Y, Herbarium of Yale University.

The keys presented here are admittedly cumbersome, but it is hoped that they will enable the worker to determine with accuracy whether or not his material can be placed in a species treated. I have not hesitated, wherever such a procedure seemed desirable, to incorporate literal translations of parts of original descriptions into the key. The term 'cell' is used throughout the paper as an English equivalent of Gomont's *articulum*, and 'cross-wall' an equivalent of Gomont's *dissepimentum*.

I am grateful to members of the staffs of the Osborn Botanical Laboratory, the Marine Biological Laboratory, the Farlow Herbarium, the New York Botanical Garden, and the Department of Botany of the University of Missouri for their generous cooperation during this work; to Prof. l'Abbé P. Frémy, Prof. L. Geitler, and Dr. G. Huber-Pestalozzi for comparing various specimens with authentic European material; to Prof. Wm. Randolph Taylor, Dr. Hannah T. Croasdale, Mr. Earl T. Rose, Prof. George J. Hollenberg, Prof. G. W. Prescott, Mr. C. M. Palmer, Mr. G. T. Velasquez, and many others cited as collectors of specimens here, who placed their collections at my dis-

posal and rendered numerous other courtesies; and to Prof. Taylor, Prof. A. W. Evans, and Prof. G. E. Nichols for suggestions concerning the manuscript during its preparation. Much of the work was pursued at Yale University with the aid of the Theresa Seessel Research Fellowship.

KEY TO GENERA

I. Trichomes more than one within the sheath; sheaths typically closed at the apices ..... Tribe I. VAGINARIEAE
  A. Trichomes few (1–5, rarely more) and loosely aggregated within the sheath
    1. Plant-mass aerial, subaerial, or submersed, compact, in some species impregnated with calcium carbonate or other foreign substances; sheaths hyaline or colored, in many species coloring blue when treated with chlor-zinc-iodine, definitely delimited, often lamellated, in most species not mucous; trichomes never capitate ..... *Schizothrix*
    2. Plant-mass submersed or subaerial, mucous; sheaths always hyaline, never coloring blue when treated with chlor-zinc-iodine, broad and often conspicuously lamellated, often entirely diffluent; trichomes attenuate and truncate or capitate at the apices .... *Hydrocoleum*[1]
  B. Trichomes numerous and closely aggregated within the sheath.—Plant-mass submersed, subaerial, or aerial, compact or gelatinous; sheaths always hyaline, in our species not coloring blue when treated with chlor-zinc-iodine, mucous and often entirely diffluent; trichomes rotund, attenuate, or calyptrate at the apices .... *Microcoleus*

II. Trichomes solitary within the sheath or without evident sheaths; sheaths not closed at the apices ..... Tribe II. LYNGBYEAE
  A. Plant-mass sufficiently coherent (in most species) to remain intact when lifted from its habitat; trichomes surrounded by evident sheaths or amorphous jelly
    1. Plant-mass characteristically submersed, rarely subaerial; sheaths definitely delimited, often lamellose, becoming mucous and diffluent only (if at all) in the hormogonial state ..... *Lyngbya*[2]
    2. Plant-mass aerial or subaerial, the interwoven and contorted filaments forming a compact stratum, from the surface of which arise upright or repent bundles of filaments; sheaths in the stratum distinct and never confluent, in the fascicles often mucous and confluent; trichomes never capitate with an enlarged apical cell, in some species calyptrate ..... *Symploca*[3]

[1] Species of Hydrocoleum, especially the marine forms, are often misplaced in the genera Symploca, Phormidium, and Oscillatoria.

[2] *Symploca Muscorum* and *Phormidium ambiguum*, when growing submersed, often produce distinctly lyngbyoid masses. Species of Plectonema, Scytonema, Tolypothrix, and Hapalosiphon, observed in unbranched or anheterocystous states, have often been confused with species of Lyngbya.

[3] If submersed, the plant-mass is a compact stratum or gelatinous mass of contorted filaments the sheaths of which are definitely delimited and seldom mucous. *Lyngbya aestuarii* when growing subaerially often produces upright fascicles from the stratum (f. *symplocoidea* Gom.). Species of Schizothrix, Fischerella, Scytonema, Tolypothrix, and Hapalosiphon produce similar fascicles under subaerial conditions.

3. Plant-mass submersed, subaerial, or in a few species aerial, compact; sheaths characteristically partially or wholly confluent into an amorphous jelly which in some species is impregnated with calcium carbonate or other foreign matter; trichomes not more than 12 μ in diameter, in several of the more common species capitate with an enlarged apical cell ..... *Phormidium*

B. Plant-mass mucous, rarely remaining intact when lifted from its habitat, submersed or subaerial; trichomes without evident sheaths or amorphous jelly

1. Trichomes not regularly and permanently spiraled throughout their entire lengths, always articulated (cross-walls evident without the application of stains or reagents), in many species straight, or variously curved and contorted, or spiraled at or for a short distance behind the apices ..... *Oscillatoria*

2. Trichomes more or less regularly and permanently spiraled throughout their entire lengths, conspicuously articulated, not evidently so, or not at all ..... *Spirulina*

Vaginarieae

Gom. ex Ann. Sci. nat. VII Bot. **15**: 290 (1892).

SCHIZOTHRIX Kütz. ex Gom., ibid. 292 (1892). *Hyphcothrix* Kütz. ex Kirchn., Schizophyc. 67 (1900). *Symplocastrum* (Gom.) Kirchn., ibid. 68 (1900). *Inactis* Kütz. ex Kirchn., loc. cit. (1900).—The four subgenera are separated from each other according to the habit of the plant masses and the color of the sheaths. No specimens of the subgen. *Inactis* Gom. have appeared in the collections examined. It is to be expected that further collecting will discover a number of as yet unreported species of Schizothrix in the southern Massachusetts flora.

Key to Species

I. Small plants, aquatic, subaerial, or aerial, with prostrate habit of growth, filaments in which false branching is not common, and hyaline sheaths ..... Subgenus I. Hypheothrix (Kütz.) Gom. ex Ann. Sci. nat. VII Bot. **15**: 306 (1892).

Stratum almost fragile, blue-green, never incrusted with lime; filaments closely interwoven, lower portions unbranched and straight, upper portions falsely branched, the branches tortuous in habit; sheaths usually firm, erose at the margins, acuminate at the apices, in the lower portions wide and lamellose, coloring blue when treated with chlor-zinc-iodine; trichomes few within the sheaths, often single in the false branches, 1.5–3 μ in diameter, constricted at the cross-walls; cells up to 5 μ long; apical cell acute-conical ..... *S. arenaria*

II. Subaerial or aerial plants with filaments ascending in erect symplocoid fascicles from a prostrate stratum, the sheaths always hyaline ..... Subgenus II. Symplocastrum Gom., ibid. 314 (1892).

Stratum indefinitely expanded, blackish or olive-green; filaments in the basal stratum tortuous and intermeshed, in the fascicles more or less straight, erect, parallel, dichotomously and appressedly false-branched; fascicles rigid, spiniform, erect, to 3 cm. or more high; sheaths

cylindrical, firm, lamellose, erose or smooth on the margins, acuminate at the apices, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, few or solitary within the sheath, parallel, evidently constricted at the cross-walls, 3–6 μ in diameter; cells subquadrate to twice as long as wide, 4–11 μ long; protoplasm coarsely granular; apical cell truncate-conical ..... *S. Friesii*

III. Plant mass terrestrial or rarely aquatic, a prostrate stratum from which, in several species, arise erect or repent symplocoid fascicles; sheaths of mature filaments colored ..... Subgenus III. CHROMOSIPHON Gom., ibid. 318 (1892).

Stratum indefinitely expanded, dark violet or brownish; filaments more or less elongate, subdichotomously and falsely branched, the branches divaricate, much contorted below, more or less parallel and agglutinated into tortuous repent fascicles above; sheaths brown- or purplish-red, with acuminate hyaline apices, firm, very wide and conspicuously lamellose, irregular or erose on the margins, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, often more or less numerous within the sheath, in most collections constricted at the cross-walls, 6–8 μ in diameter; cells subquadrate to twice as long as wide; protoplasm coarsely granulose in all except the apical cell; apical cell conical, often very acutely so ..... *S. purpurascens*

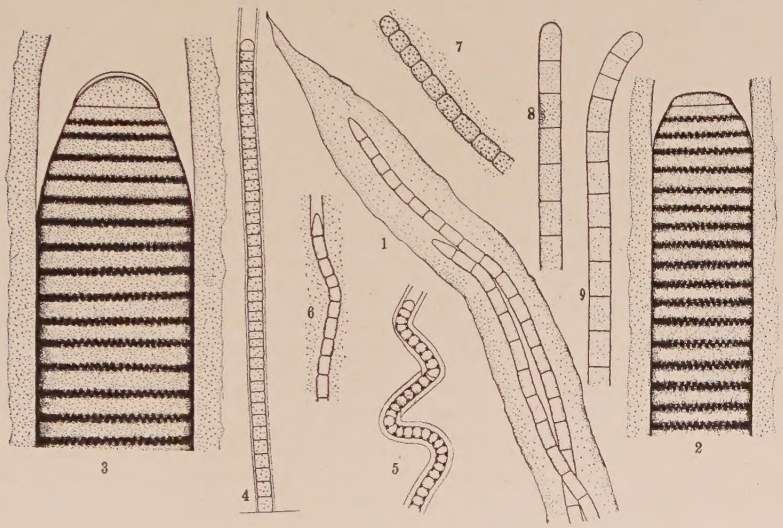
SCHIZOTHRIX ARENARIA (Berk.) Gom., Ann. Sci. nat. VII Bot. **15**: 312, pl. viii, f. 11, 12 (1892). *S. Friesii* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), in part, not Gom.—*Fig. 1.* This is an apparently frequent alga of denuded soil. Smith in *Fresh-water Algae of the United States* (1933) does not cite the species for the United States, though Gomont, ibid. 313, mentions a specimen collected by Setchell in this country. Specimens seen: FALMOUTH: on denuded ground at south end of Park Street, Woods Hole, *Drouet 1929*, 25 Aug. 1936 (D, F, S, T, Y); clay bank near entrance to Gansett Estate, Woods Hole, *Drouet 1217*, 5 Aug. 1934 (D, W); on clay bank, side of road to Quisset, *G. T. Moore*, 20 July 1898 (W).

SCHIZOTHRIX FRIESII (Ag.) Gom., Ann. Sci. nat. VII Bot. **15**: 316, pl. ix, f. 1, 2 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), in part. *S. Purcellii* W. R. Taylor,[1] Proc. Acad. Nat. Sci. Phila. **80**: 91, pl. 12, f. 7–9 (1928). *Symplocastrum Brittoniae* Gardn.,[2]

[1] I interpret the TYPE of this species in the Herb. W. R. Taylor, BRITISH COLUMBIA: red surface mud from nearly dried pool, parkland, Cañon Creek near Golden, *W. R. Taylor*, 2 Sept. 1923, as the juvenile state of *S. Friesii*. The typical symplocoid habit is not developed, but the filaments differ in no other respect from the authentic material of *S. Friesii* cited here.

[2] A study of the TYPE in the Herb. New York Bot. Gard. and an ISOTYPE in my own herbarium, PUERTO RICO: summit of El Yunque, Catalina-Yunque Trail, Luquillo Mountains, *E. G. Britton 7648*, 23–26 Feb. 1923, shows that, in spite of word to the contrary in the original description, the apical cells are conical and the sheaths are laminose, as in the authentic Gomontian specimens of *S. Friesii* cited here. On the average, in a large number of trichomes seen, the cells are no longer than those seen in *S. Friesii*. The errors in the description apparently arose from the poor state of preservation of many trichomes in the upper portions of the fascicles.

New York Acad. Sci., Sci. Surv. Porto Rico **8**(2): 287, pl. 2, f. 11 (1932). Authentic material: Desmaz., Pl. cryptog. France, éd. I, 1971 (F); Rabenh. Alg. 394 (F), 492 (T), 2364 (T), 2445 (T).—Infre-



quently encountered on soil and mosses in shady woods and along paths. Two specimens: FALMOUTH: Fay's Woods, Woods Hole, *W. G. Farlow*, July 1889 (F); earth by roadside, Nobska Woods, *J. E. Humphrey*, 22 July 1896 (W).

SCHIZOTHRIX PURPURASCENS (Kütz.) Gom., Ann. Sci. nat. VII Bot. **15**: 320, pl. ix, f. 6–8 (1892). Authentic material: Rabenh. Alg. 851 (N).—Two collections, the var. CRUENTA (Lespin.) Gom., ibid. 321: FALMOUTH: Town Playground, Woods Hole, *Drouet 2173*, 30 Aug. 1937 (D, S). TISBURY: subaerial in a springy meadow at upper end of Lake Tashmoo, *Drouet 1902*, 21 July 1936 (D, F, S, T, Y).

HYDROCOLEUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 332 (1892). *Hydrocoleus* Forti, Syll. Myxophyc. 315 (1907); Tilden, Minn. Alg. **1**: 134 (1910); Geitler, Rabenh. Kryptogamen-Fl. **14**: 1146 (1932). —Though Kützing, *Phycologia generalis*, 196 (1843), originally proposed this genus as Hydrocoleum and his orthography has been perpetuated by its use in Gomont's 'Monographie,' the masculine form of the name as written by Forti has been continued in no small part of the recent literature. The forms here considered are all marine plants of rather large dimensions. No specimens of freshwater species from southern Massachusetts have yet been seen.

KEY TO SPECIES

I. Plant-mass epiphytic on larger marine algae or growing on rocks in quiet salt water; trichomes usually less than 15 μ in diameter.—Plant-mass greenish or almost black, slimy, in mucous clumps on larger marine algae or in gelatinous strata on rocks; filaments parallel, often falsely branched; sheaths broad, mucous, acuminate or open at the apices, under certain conditions entirely diffluent; trichomes yellowish-green or blue-green, many within the sheath at the base of the filament, few in the branches, not constricted at the cross-walls, 8–16 (usually 9–11) μ in diameter; cells 1/3–1/6 as long as wide, 2.5–4.5 μ long; cross-walls granulated; apex of trichome attenuate-truncate. . *H. lyngbyaceum*

II. Plant-mass subaerial or aquatic, usually in brackish or quiet salt water; trichomes more than 15 μ in diameter.

A. Plant-mass brownish or greenish, forming gelatinous expansions on floating algae or subaerial on sand or other algae; sheaths very mucous, often entirely diffluent; trichomes pale green or brownish, not constricted at the cross-walls, 14–21 (usually 17–19) μ in diameter; cells 1/3–1/6 as long as wide; cross-walls granulated; apex of trichome briefly attenuate-truncate. . . . . *H. glutinosum*

B. Plant-mass brownish or blackish, phormidioid, mucous, or in drying almost chartaceous, indefinitely expanded, never caespitose, usually covering floating algae or aquatic plants in brackish water, sometimes subaerial; sheaths at first subamorphous, hyaline, thin, soon entirely diffluent; trichomes brownish or blue-green, not constricted at the cross-walls, 24–35 (usually 25–30) μ in diameter; cells 1/5–1/8 as long as wide; cross-walls granulated; apex of trichome briefly attenuated, the apical cell bearing a hemispherical calyptra. . . . . *H. Holdenii*

HYDROCOLEUM LYNGBYACEUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 337, pl. xii, f. 8, 9, 10 (1892); Setchell, Erythea **4**: 89 (1896), Phyc. Bor-Amer. **5**: 204 (1896); Collins, RHODORA **2**: 42 (1900); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913); Tilden, Minn. Alg. **1**: 136 (1910). Authentic material: Crouan, Alg. mar. Finistère **3**: 325 (F).—The typical variety occurs as greenish or blackish gelatinous masses on Ascophyllum, etc. in quiet salt water. Specimens seen: FALMOUTH: on Ascophyllum, Ram Island flats, Woods Hole, *M. Poole*, 17 Aug. 1936 (D, F, S, T, Y); Penzance Point, Woods Hole, *W. A. Setchell & W. J. V. Osterhout*, 30 Aug. 1894 (W); Woods Hole, *I. Holden*, 18 Aug. 1894 (F); on *Ascophyllum nodosum*, Wood's Hole, *W. A. Setchell*, 14 Aug. 1904 (Phyc. Bor.-Amer. 204, W, T, Y). GOSNOLD: south shore of Penikese Island, *J. G. Poole & Drouet*, 7 July 1930 (D).

HYDROCOLEUM GLUTINOSUM (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **15**: 339 (1892); Collins, RHODORA **2**: 42 (1900); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913). *Lyngbya nigrescens* var. *major* Farlow, Mar. Alg. New Engl, 35 (1891), Alg. Am. Bor. Exs. **1**: 47. *L. aestuarii* f. *limicola* of Collins, Phyc. Bor.-Amer. **29**: 1402 (1907), in certain specimens, not Gom. *Oscillatoria margaritifera* of Taylor and Hazen

in Lewis, RHODORA **26**: 212, 215 (1924), in part, not Kütz. ex Gom. Authentic material: Crouan, Alg. mar. Finistère **3**: 328 (F).—*Fig. 2.* The typical variety is commonly found in blackish-green or brown sheets on sand or on algae floating in quiet salt or brackish water. This species and the next are often confused with *Oscillatoria margaritifera* and *O. Bonnemaisonii*, which they resemble superficially. Phyc. Bor.-Amer. 1402 is represented in the Herbarium of Yale University by an excellent specimen of *H. glutinosum*, and in the Herbarium of the Marine Biological Laboratory by typical *Lyngbya aestuarii*. Specimens seen: EASTHAM: on mud of a salt marsh, Bay shore, *F. S. Collins*, 10 Aug. 1897 (Phyc. Bor.-Amer. 1402, Y [not W]). FALMOUTH: on Vaucheria floating in Gardiner's Ditch, Woods Hole, *Drouet 1917*, 17 Aug. 1936 (D, F, S, T, Y); Wood's Holl, *W. G. Farlow*, 1875 (N); ad Zosteram et algas mortuas, Wood's Holl (Alg. Am. Bor. Exs. 47, F, Y); Gardiner's Ditch, Woods Hole, *Anon.*, 15 July 1931 (W); West Falmouth, *F. S. Collins* (F); in masses of dead floating Zostera and algae, Woods Hole, *W. G. Farlow*, Aug. 1875 (F). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W).

HYDROCOLEUM HOLDENII Tilden, **descr. emend.** *H. Holdenii* Tilden, RHODORA **3**: 254 (1901); Minn. Alg. **1**: 137 (1910); Forti, Syll. Myxophyc. 319 (1907); Geitler, Rabenh. Kryptogamen-Fl. **14**: 1147 (1932). *H. majus* Holden, RHODORA **1**: 197, pl. 9, f. 7, 8 (1899), Phyc. Bor.-Amer. **13**: 602 (1899); Collins, RHODORA **2**: 42 (1900); not Martens. *Oscillatoria margaritifera* of Collins, Phyc. Bor.-Amer. 1708a, b (1911), not Kütz. ex Gom. *O. Bonnemaisonii* of Collins, ibid. 1707e (1911), not Crouan ex Gom. Stratum luteo-fuscum vel nigro-viride, phormidioideum, mucosum aut siccante fere papyraceo-chartaceum, indefinite expansum, haud caespitosum, vulgo algas majores et alias plantas aquaticas tectans, nonnumquam ad littora arenosa intra limites fluctuum maris subaeriale; vaginis initio subamorphis, hyalinis, plus minusve tenuibus, demum omnino diffluentibus, chlorozincico iodurato haud caerulescentibus; trichomatibus vivis luteo-fuscis vel aerugineis, ad genicula non constrictis, 24 μ ad 35 μ (vulgo 25 μ ad 30 μ) crassis, intra vaginas singulis binisve; articulis diametro trichomatis quintuplo ad octuplo brevioribus, 3.5 μ ad 4.5 μ longis; protoplasmate granuloso, dissepimentis grosse-granulatis; apice trichomatis breviter et leviter attenuata; cellula apicali calyptram hemisphaericam praebente (v. s., v. v.). *Fig. 3.*—In quiet brackish or salt water along the coast of New England. Specimens seen: MASSACHUSETTS: Eastham: in marshes, *F. S. Collins*, 13 July 1907 (Phyc. Bor.-Amer. 1708a, b, *specim. manca*, W, T, Y); among Calothrix, etc. in a salt marsh, *F. S. Collins*, July 1909 (Phyc. Bor.-Amer. 1707e, *specim. mancum*, W, T, Y). Falmouth: floating in a salt marsh at east side of Eel Pond, Woods Hole, *Drouet 1927*, 24 Aug. 1936 (D, F, S, T, Y); Gardiner's Ditch, Woods Hole, *Drouet 1946*, 17 Sept. 1936 (D, F). CONNECTICUT: on old Spartina stems in ditches of a salt marsh, Bridgeport, *I. Holden*, 24 May 1896 (Phyc. Bor.-Amer.

602, N, T, W, Y); Cook's Point, Bridgeport, *I. Holden*, 30 May 1896 (TYPE of *H. majus* Holden in Farlow Herb.). NEW YORK: on algae in pool in salt marsh, Cold Spring Harbor, *L. N. Johnson 1089*, July 1895 (F).

Doubts concerning the validity of this species have been raised by Geitler (ibid.). The material distributed by Holden in Phyc. Bor.-Amer. 602 is composed of badly shriveled trichomes which are often conspicuously torulose, a result, apparently, of the method of preparation of the exsiccata. The figure accompanying Holden's original description of *H. majus* must have been drawn from such dried material, since it is considerably at variance with the description. The type material in the Farlow Herbarium, however, contains few such shriveled trichomes and matches the written description exactly. This material, according to the herbarium label, grew in a salt marsh about the culms of Spartina, so that the stratum was apparently 'pierced' by these culms and became tubular (Geitler's 'röhrig') when the water level was lowered. Similar tubular growths are produced by this alga on Spartina culms during the dry season (when the water level is lowered by evaporation) in Gardiner's Ditch, a brackish marsh at Woods Hole. In the type material as well as in that of my own collecting, the range in size of trichomes is somewhat greater than that described by Holden. By actual experimentation I find that the trichomes, if dried very rapidly, retain the exact measurements characteristic of them in the living condition, despite Prof. Geitler's suggestion that in the material distributed in Phyc. Bor.-Amer. 602 "dieser Wert dürfte in Vergleich zur Breite des turgeszenten, kreisrunden Trichoms zu hoch sein." The trichomes referred to species of Oscillatoria in Phyc. Bor.-Amer. 1707e and 1708a & b are sheathed forms rather miserably preserved; though the plant-masses are in a very juvenile state, I cannot refer them to other than this species. *H. Holdenii*, like *H. glutinosum*, is a form with extremely diffluent sheaths inhabiting chiefly brackish water or muddy and sandy shores in the intertidal zone. From the latter species it differs in its greater trichomatal dimensions and in the presence of a hemispherical thickening of the outer wall of the apical cell.

MICROCOLEUS Desmaz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 350 (1892).—I regret that I cannot admit to this list two species often encountered in fresh water in North America: *M. paludosus* (Kütz.) Gom. and *M. lacustris* Farl. ex Gom. Croasdale's reports of these in her *Fresh Water Alg. Woods Hole, Mass.*, 21 (1935), cannot be based

upon other than *M. chthonoplastes*, since the material was collected in brackish water of Gardiner's Ditch, Woods Hole; her specimens have been misplaced.

KEY TO SPECIES

I. Plant-mass subaerial or aquatic in brackish or salt water, rarely if ever in strictly fresh water; trichomes attenuate, conical or acuminate at the apices, never capitate
  A. Plant-mass yellowish or blackish-green, an extended stratified layer in or about brackish ponds or salt marshes; sheaths mucous, often entirely diffluent; trichomes bright blue-green, closely aggregated and numerous within the sheath, 2.5–6 μ in diameter, constricted at the cross-walls; cells subquadrate to twice as long as wide; cross-walls often granulated; apical cell acute-conical ..... *M. chthonoplastes*
  B. Plant-mass gray-green, or filaments mixed with other algae, usually in intertidal zones, seldom in brackish water; sheaths ample and mucous, often entirely diffluent; trichomes olive-green, more or less numerous within the sheath, conspicuously constricted at the cross-walls, 1.5–2 μ in diameter; cells 2.2–6 μ long; cross-walls pellucid, not rarely granulated; apical cell long-attenuate and very acutely conical ..... *M. tenerrimus*

II. Filaments subaerial or aerial on damp soil, rarely forming a black, tough, compact stratum; sheaths cylindrical, often entirely diffluent; trichomes green or olive-green, numerous and closely aggregated within the sheath, straight when escaped from the sheath, not at all constricted at the cross-walls, long-attenuate and capitate at the apices, 3.5–7 μ in diameter; cells subquadrate or half as long as wide, 3–7 μ long; cross-walls usually granulated; apical cell bearing a depressed-conical calyptra ..... *M. vaginatus*
  Trichomes 4.4–6.5 μ in diameter, cells subquadrate or half as long as wide ..... var. *Vaucheri*

MICROCOLEUS CHTHONOPLASTES (Fl. dan.) Thur. ex Gom., Ann. Sci. nat. VII Bot. **15**: 353, pl. xiv, f. 5–8 (1892); Farlow, Alg. Am. Bor. Exs. **5**: 227 (1889), Mar. Alg. New Engl., 33 (1891); Collins, RHODORA **2**: 42 (1900); Tilden, Minn. Alg. **1**: 156 (1910); Davis, Bull. U. S. Bur. Fish. 1911 (2): 797 (1913). *Oscillatoria subtorulosa* of Davis, loc. cit. (1913), not Farl. apud Tild. *?M. lacustris* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), not Farl. ex Gom. *?M. paludosus* of Croasdale, loc. cit. (1935), not Gom. Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 227 (F, Y).—Subaerial on intertidal flats and borders of salt marshes, often in masses of algae floating in brackish water, seldom and only accidentally in fresh water. Specimens seen: BOURNE: Red Brook, Pocasset, *H. Croasdale*, 12 Sept. 1934 (D). FALMOUTH: Penzance salt marsh, Woods Hole, *Drouet 1174* (D, F, S, T, Y), *1175* (D), 13 July 1934; Penzance Point, Woods Hole, *W. J. V. Osterhout*, 17 July 1895 (W, T); Wood's Holl, Aug. 1877 (F); Gardiner's Road Pond, Woods Hole, *W. R. Taylor*, 8 July 1917 (T); on mud, salt marshes, Woods Hole, *W. A. Setchell 816*, 16 Aug. 1894 (N); Wood's Holl, *W. G. Farlow*, Aug. 1877 (Alg. Am. Bor. Exs. 227,

F, Y); Falmouth, *F. S. Collins*, July 1880 (N); Shingle Pond, Gansett, *W. R. Taylor*, 30 June 1922 (T). GOSNOLD: salt marsh, Pasque Island, *C—C. Jao*, 26 June 1934 (D); salt marsh flats, e. end of Pasque Island, *W. R. Taylor*, 5 July 1932 (T, D).

MICROCOLEUS TENERRIMUS Gom., Ann. Sci. nat. VII Bot. **15**: 355, pl. xiv, f. 9–11 (1892); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913). *Oscillatoria amphibia* of Davis, ibid. 798 (1913), not Ag. ex Gom. Authentic material: Wittr. & Nordst., Alg. exs. 696 (F).—This species has apparently remained unrecognized by collectors because it is so seldom seen in pure strata; often it passes in American herbaria under the name of *Oscillatoria amphibia*. It has been reported from Maine by Collins, RHODORA **5**: 233 (1903); but Frémy, in a resume of the geographic distribution of the species in Bull. Soc. Linn. Normandie sér. 7, **7**: 181ff (1924), does not include the eastern coast of North America within its range. In the vicinity of Woods Hole, one finds the species sparingly among other subaerial Myxophyceae in salt marshes, on intertidal zones of shores, pilings, walls, etc. Specimens seen: FALMOUTH: subaerial on Grassy Island, Woods Hole, *Drouet 1886*, 17 July 1936 (D, F, S, T, Y, Frémy); pilings at entrance of Eel Pond, Woods Hole, *M. Thurlow*, 17 July 1936 (D); on woodwork, Woods Hole, *F. S. Collins*, 16 Aug. 1904 (sub. nom. *Oscillatoria amphibia*, N).

MICROCOLEUS VAGINATUS (Vauch.) Gom. var. VAUCHERI (Kütz.) Gom., Ann. Sci. nat. VII Bot. **15**: 356, pl. xiv, f. 12 (1892). Authentic material: Erbar. critt. ital. **10**: 485 (F); Rabenh. Alg. 353 (F).—Often encountered on soil and not seldom appearing in soil cultures. Dispersed trichomes found in soil samples have been mistaken for those of *Phormidium autumnale*. Specimens seen: FALMOUTH: on sandy bank by Quisset Avenue north of Golf Course, Woods Hole, *Drouet 1907*, 5 Aug. 1936 (D, F, T). TISBURY: on lawn about pumping station at Tashmoo Spring, *G. Velasquez & Drouet 1895*, 21 July 1936 (D, F, S, T, Y).

LYNGBYEAE

Kütz. emend. Gom., Ann. Sci. nat. VII Bot. 16: 91 (1892).

LYNGBYA Ag. ex Gom., idem, 118 (1892).—The inconstancy of the generic characters in the Oscillatoriaceae during the period of formation and development of hormogonia is well illustrated in many collections of species of Lyngbya. The tenacity of the sheath material in this genus is often so great that developing hormogonia in the lower parts of the sheath are observed to exert much pressure upon the cells of neighboring hormogonia and to produce in them a variety of anomalous shapes; in many instances, they grow in such a manner as to lie side by side and parallel with each other within the sheath, thus producing the habit of one of the Vaginarieae. In other cases, such great pressure may be exerted that a hormogonium may burst through the sheath and produce the effect of false branching in the filament as in the genus Plectonema.

KEY TO SPECIES

I. Filaments attached by a basal end to the substratum and usually growing perpendicular to it.—Filaments solitary, almost straight or subflexuous, epiphytic on other algae in brackish water; sheaths very thin, hyaline, not at all (or in our material, not readily) coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, in our material somewhat constricted at the cross-walls, 1.8–2.8 μ in diameter, neither attenuate nor capitate at the apices; cells subquadrate or shorter than wide, 1–3 μ long; protoplasm coarsely granulose; cross-walls conspicuous, pellucid, not granulated; apical cell rotund, its outer membrane not at all thickened ..... *L. infixa*

II. Filaments attached to the substratum laterally, often throughout the entire length of the sheath.—Twining about other filamentous algae, principally in fresh water; filaments 1.5–2 μ in diameter; sheath thin, hyaline, not coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, 1–1.5 μ in diameter, not constricted at the cross-walls, not attenuate at the apices; cells 1–2 μ long; protoplasm homogeneous; cross-walls not granulated; apical cell rotund ..... *L. epiphytica*

III. Filaments usually unattached to a substratum, or attached laterally by a portion of the sheath

A. Plants of marine or brackish water, not or rarely found in strictly fresh water

1. Trichomes 2 μ in diameter.—Filaments mixed with other algae in brackish water, usually short, more or less regularly spiraled, or often straight; sheaths thin, hyaline, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, about 2 μ in diameter, somewhat constricted at the cross-walls; cells 1.2–3 μ long; protoplasm finely granulose; cross-walls marked with two protoplasmic granules; apical cell rotund ..... *L. Lagerheimii*

2. Trichomes more than 2 μ in diameter

a. Sheaths not coloring blue when treated with chlor-zinc-iodine

(I) At least the older sheaths yellowish-brown.—Stratum brown or blue-green, subaerial or floating, sometimes forming symplocoid fascicles; sheaths at first hyaline, later colored yellowish-brown, often very thick and lamellose; trichomes blue-green or olive, at the apices often slightly attenuate-capitate and truncate, not constricted at the cross-walls, 8–24 μ in diameter; cells 1/3–1/6 as long as wide; protoplasm finely granulose; cross-walls granulated; outer membrane of apical cell conspicuously thickened ..... *L. aestuarii*

(II) Sheaths always hyaline

(A) Plant-mass extensive, dark blue-green, dull green, or yellowish-green; filaments crisp, elongate, variously intermeshed; sheaths very thick, to 11 μ wide, sometimes lamellose; trichomes blue-green, brownish, or grayish-green, not constricted at the cross-walls, not attenu-

ated at the apices, 16–60 μ in diameter; cells 1/6–1/15 as long as wide; protoplasm finely granulose; cross-walls never granulated; apical cell rotund, without calyptra ..... *L. majuscula*

(B) Plant-mass expanded, slimy, brownish, dark green, or blackish, usually with a violet tinge in drying, or forming a pannose stratum; filaments elongate, straight, subrigid; sheaths lamellose, to 5 μ thick; trichomes olive or blue-green, often violet in dried material, not constricted at the cross-walls, not attenuated at the apices, 9–25 (in our material 9–12) μ in diameter; cells 1/3–1/8 as long as wide; protoplasm finely granulose; cross-walls granulated; apical cell rotund, without a calyptra ..... *L. confervoides*

(C) Plant-mass expanded, mucous, usually dull yellow-green or obscurely blue-green, sometimes forming a pannose stratum; filaments not rigid or straight, always flexuous; sheaths lamellose, to 3 μ thick; trichomes yellowish-green, olive, or blue-green, somewhat attenuate and capitate at the apices, not constricted at the cross-walls, 5–12 μ in diameter: cells 1/3–1/6 as long as wide; protoplasm finely granulose; cross-walls frequently granulated; membrane of the apical cell thickened into a distinct depressed-conical or rotund calyptra ... *L. semiplena*

b. Sheaths coloring blue when treated with chlor-zinc-iodine.—Stratum subgelatinous, coriaceous, yellowish-brown or olive, in drying often dark violet; filaments contorted, much intertwined; sheaths hyaline, at first thin, later to 3 μ thick and lamellose; trichomes olive-green, not constricted at the cross-walls, not attenuated at the apices, 2.5–6 μ in diameter; cells quadrate to 1/3 as long as wide; protoplasm granulose; cross-walls conspicuous, sometimes granulated; membrane of the apical cell thickened into a rotund calyptra ..... *L. lutea*

B. Plants of fresh water exclusively.—Plant-mass a fragile, scarcely gelatinous stratum, intensely yellowish-brown; filaments short, stiff, more or less curved; sheaths at first thin and hyaline, later thick and opaque-brown, not coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, often torulose, 0.9 μ in diameter; cells shorter than wide, 0.6–0.8 μ long; cross-walls not granulated; apical cell rotund .... *L. ochracea*

LYNGBYA INFIXA Frémy, Compt. Rend. Acad. Sci. Paris **195**: 1414 (1932); Mém. Soc. nat. Sci. nat. & math. Cherbourg **41**: 110, pl. 30, f. 1 (1934).—*Fig. 4.* I place the material cited below[1] in this species

[1] I cannot but suspect that this material should more properly be considered the juvenile form of *L. Digueti* Gom. in Hariot, Journ. de Bot. **9**: 169 (1895), as repre-

at the suggestion of Prof. Frémy, even though the sheaths become definitely blue when treated with chlor-zinc-iodine and the trichomes are slightly constricted at the cross-walls. These characters are not preserved well in my collections *1126* and *1134* cited below because the greater number of specimens were prepared for distribution from material immersed for more than a year in 2% formalin. Specimens seen: GOSNOLD: in a boggy salt marsh on north shore of Pasque Island, *Drouet 1126*, 26 June 1934 (D); on Cladophora, Pasque Island, *Drouet 1132*, 26 June 1934 (D, F, T, W, Y). OAK BLUFFS: growing on Cladophora, Cottage City, *F. S. Collins*, 19 Sept. 1883 (sub. nom *Leibleinia* sp., N).

LYNGBYA EPIPHYTICA Hieron. apud Lemmermann, Ark. f. Bot. **2**(2): 103 (1904); Forti, Syll. Myxophyc., 289 (1907). Hieron. *nomen subnudum* in Kirchn., Schizophyc., 67 (1900);—Epiphytic on freshwater algae, especially upon large sheathed Hormogoneales. Specimens seen: FALMOUTH: on *Dichothrix* sp. on a submerged piece of tile, Salt Pond, *E. T. Rose*, 19 June 1936 (D); on *Scytonema* sp., Silver Beach Pond, West Falmouth, *H. Croasdale*, 1 Sept. 1933 (D, F, T).

LYNGBYA LAGERHEIMII (Möb.) Gom., Ann. Sci. nat. VII Bot. **16**: 147, pl. iv, f. 6, 7 (1892); Setchell, Bull. Torr. Bot. Club **22**: 430 (1895); Tilden, Minn. Alg. **1**: 111 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Croasdale, Freshwater Alg. Woods Hole, Mass., 20 (1935). —*Fig. 5.* Usually found in muck on the bottoms of subsaline ponds, often mixed with other algae. Filaments are not abundant in any of the specimens examined:[1] FALMOUTH: in a slightly brackish marsh about Chara Pond, *Drouet 1860*, 20 June 1936 (D); in brackish water, Little Pond, *W. A. Setchell & W. J. V. Osterhout*, 17 Aug. 1895 (W). GOSNOLD: Dune Pond, Nashawena Island, *Drouet 1167*, 3 July 1934 (D).

LYNGBYA AESTUARII (Mert.) Liebm. ex Gom., Ann. Sci. nat. VII Bot. **16**: 127, pl. iii, f. 1, 2 (1892); Farlow, Mar. Alg. New Engl., 34 (1891); Collins, RHODORA **2**: 42 (1900), Phyc. Bor.-Amer. **21**: 1009 (1903), ibid. **29**: 1402 (1907), in certain specimens; Tilden, Minn. Alg. **1**: 121 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Taylor in Lewis, RHODORA **26**: 212 (1924); Hazen in Lewis, RHODORA **26**: 215 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21

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sented in Wittrock & Nordstedt, *Algae Exsiccatae* 1522a and b from Sweden. This species is described in the Myxophycean manuals now in vogue as possessing lateral attachment of the filaments; although there is nothing in Gomont's description or in Wittrock & Nordstedt, *Algae Exsiccatae* 1522a–c, determined by M. Gomont, to lead us to believe that the attachment is not basal.

[1] My conception of this species has been based solely upon the descriptions and figures in Gomont's 'Monographie' and in Möbius, Hedwigia **28**: 312 (1889), and upon such presumably unauthenticated specimens as Phyc. Bor.-Amer. 53 and 1008. In a recent comparative study of the herbarium material which I have included in this species, I find one specimen, PARÁ: on Utricularia in fish ponds, Museu Paraense, Belém, *Drouet 1275*, 27 June 1935 (D, F, N, S, Y, Herb. Univ. Mich., Rijksherb. at Leiden, Mus. Nac. at Rio de Janeiro) distributed as *L. Lagerheimii* and noted as such in my article, The Brazilian Myxophyceae, I, Amer. Journ. Bot. **24**: 604 (1937), to be referable to *L. Digueti* Gom. (see footnote 9 of this paper).

(1935). *L. ferruginea* of Farlow, Rept. U. S. Fish Comm. 1875: 24 (1876). Authentic material: Rabenh. Alg. 773 (F), 2055 (F, T).—*F. limicola* Gom., f. *natans* Gom., f. *symplocoidea* Gom., f. *ferruginea* (Ag.) Gom., and f. *aeruginosa* (Ag.) Wolle ex Gom., ibid. 129, 130 (1892), appear in the southern Massachusetts region to be rather ecological variations of a single variable species than distinguishable taxonomic entities. The species is the commonest of the Lyngbyas in brackish and salt water; it is the chief constituent of the extensive subaerial growths of Myxophyceae on mud of salt marshes. In none of our specimens is the sheath colored blue when treated with chlorzinc-iodine as described for *L. stagnina* Kütz. ex Gom. (pro synon. *L. aestuarii*) by Lemmermann, Forschungsber. biol. Sta. Plön **12**: 145 (1905), and by Boye-Petersen, Bot. Icel. **2**(2): 285, f. 6 (1928). Specimens examined: EASTHAM: salt marsh, Bay shore, *F. S. Collins*, 10 Aug. 1907 (Phyc. Bor.-Amer. 1402, W, T, not Y). FALMOUTH: subaerial, Penzance salt marsh, Woods Hole, *Drouet 1892*, 19 July 1936 (D), *Drouet 1178*, 13 July 1934 (D, Y); Gansett Pond No. 2, *W. R. Taylor*, 6 July 1917 (T); Falmouth, *F. S. Collins*, July 1880 (F); Penzance Point, *R. A. Esten*, 5 July 1893 (W); Park Ditch, Woods Hole, *E. T. Rose*, 22 July 1936 (D); Siders Pond, *H. Croasdale*, 6 Aug. 1936 (D); Wood's Holl, *Herb. C. L. Anderson* (N). MATTAPOISETT: on Spartina, *F. S. Collins*, 14 Sept. 1902 (N; Phyc. Bor.-Amer. 1009, W, T, Y). GOSNOLD: Nonamesset Island, *E. T. Rose*, 29 June 1936 (D, F, T); Deer Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D, N, S); Botanical Survey of Penikese Island, 24 July 1923 (W); brackish pools, Naushon Island, *Anon.*, July 1908 (W); Shore Pond, Tarpaulin Cove, *W. R. Taylor*, 4 Aug. 1927 (T). EDGARTOWN: mats over decaying Zostera leaves in a salt marsh, *M. A. Howe*, 8–18 Aug. 1900 (N).

LYNGBYA MAJUSCULA (Dillw.) Harv. ex Gom., Ann. Sci. nat. VII Bot. **16**: 131, pl. iii, f. 3, 4 (1892); Farlow, Rept. U. S. Comm. Fish & Fisheries 1871–72: 293 (1873), Proc. Amer. Acad. **10**: 380 (1875), Rept. U. S. Fish Comm. 1875: 24 (1876); Collins, Alg. Am. Bor. Exs. **5**: 228 (1889); Farlow, Mar. Alg. New Engl., 34 (1891); Setchell, Phyc. Bor.-Amer. **5**: 202 (1896); Collins, RHODORA **2**: 42 (1900); Tilden, Minn. Alg. **1**: 123 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935). Authentic material: Rabenh. Alg. 588 (T); Harv., Friendly Ids. Alg. 120 (F), 121 (F); Harv., Ceylon Alg. 84 (F).—This species, usually found only in marine waters, is often confused, as Geitler has pointed out in Rabenh. Kryptogamen-Fl. **14**: 1060 (1932), with the strictly freshwater *Plectonema Wollei* Farl. ex Gom. In the Woods Hole region, *L. majuscula* is usually washed ashore in large clumps; less often it is seen as extended strata on mud in quiet salt water. Specimens seen: BOURNE: Scraggy Neck, *A. M. Russell*, 13 Aug. 1917 (T); Pocasset, *M. Sumwalt*, 25 July 1925 (T). FALMOUTH: Nobska, *W. G. Farlow* (F); Bay traps, Woods Hole, *Anon.*, 30 Aug. 1932 (D); Little

Harbor, Woods Hole, *Anon.*, 20 June 1931 (W); Wood's Hole, *B. L[ivingston]*, Aug. 1875 (D, F, T, Y); Woods Holl, *R. A. Esten*, July 1893 (W); washed ashore, Wood's Hole, *W. A. Setchell*, 16 Aug. 1894 (Phyc. Bor.-Amer. 202, N, T, W, Y); Woods Holl, *Herb. A. B. Hervey 9* (N); Falmouth, *G. W. Perry*, 22 Aug. 1882 (N); Falmouth, *F. S. Collins*, July 1880 (F); Falmouth, *Anon.*, July 1882 (T); floating, Woods Holl, *W. A. Setchell*, 18 July 1890 (F, N); Wood's Hole, *D. C. Eaton*, Aug. 1871 (Y); Woods Hole, *I. Holden*, 17 Aug. 1894 (F, N); Vineyard Sound, *W. G. Farlow* (F); Juniper Point, Woods Hole, *W. R. Taylor*, 9 Aug. 1928 (T); Meganset Beach, North Falmouth, *W. R. Taylor*, 21 July 1931 (T, D). TISBURY: Vineyard Haven, *F. S. Collins* (W), Sept. 1883 (Alg. Am. Bor. Exs. 228, D, F, Y). OAK BLUFFS: Highlands, *C. C. Curtis*, 11 July 1892 (N). EDGARTOWN: floating in its harbor, *M. A. Howe*, 8 Aug. 1900 (N). MATTAPOISETT: *G. W. Perry*, 19 Aug. 1884 (N).

LYNGBYA CONFERVOIDES Ag. ex Gom., Ann. Sci. nat. VII Bot. **16**: 136, pl. iii, f. 5, 6 (1892); Collins, RHODORA **2**: 42 (1900); Tilden, Minn. Alg. **1**: 119 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913). *L. lutco-fusca* of Farlow, Rept. U. S. Fish Comm. 1875: 24 (1876), Alg. Am. Bor. Exs. **1**: 48, Mar. Alg. New Engl., 35 (1891). *L. semiplena* of Setchell, Phyc. Bor.-Amer. **30**: 1452b (1908), not of Nott, ibid. 1452a; Tilden, Minn. Alg. **1**: 118 (1910), in part; Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935), in part; not J. Ag. ex Gom. Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 48 (F, N, Y); Hohenack. Meeresalg. 500(T).—Found on intertidal zones of wharf pilings, rocks, and shores, also in tide pools. New England material rarely exceeds 12 μ in trichomatal diameter. I have been unable to locate the specimens from brackish water of Chara Pond reported by Croasdale, ibid. 21 (1935). Specimens seen: FALMOUTH: with *L. majuscula*, Meganset Beach, North Falmouth, *W. R. Taylor*, 21 July 1931 (T, D); Little Harbor, Woods Hole, *G. J. Hollenberg*, 27 July 1934 (D), *W. A. Setchell*, 18 Aug. 1894 (Phyc. Bor.-Amer. 1452b, W, T, Y), *H. Croasdale*, 30 July 1934 (D, F, T); on government wharf, Woods Holl, *W. G. Farlow*, Aug. 1876 (F); ad lapides et saepes, Wood's Holl, *W. G. Farlow* (Alg. Am. Bor. Exs. 48, F, N, Y). NO MAN'S LAND: *W. R. Taylor 17035*, 16 Aug. 1932 (T, D).

LYNGBYA SEMIPLENA (Ag.) J. Ag. ex Gom., Ann. Sci. nat. VII Bot. **16**: 138, pl. iii, f. 7–11 (1892). Not *L. semiplena* of Nott, Phyc. Bor.-Amer. **30**: 1452a (1908), nor of Setchell, idem 1452b (1908); not of Tilden, Minn. Alg. **1**: 118 (1910), at least as to southern Massachusetts specimens; not of Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); not of Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935). Authentic material: Wittr. & Nordst., Alg. exs. 280 (F); Hauck & Richt., Phyk. univ. 328 (F).—Found in the same type of habitat as *L. confervoides* and often mixed with it; often collected in brackish water. Phyc. Bor. Amer. 1452a is treated in the present paper as *Phormidium ambiguum*, 1452b as *L. confervoides;* Davis' uncertain

material is referred to under *Symploca atlantica*. Specimens seen: FALMOUTH: on wooden piers, Little Harbor, Woods Hole, *Drouet 1923*, 20 Aug. 1936 (D, F, S, T, Y); on wood submerged in Mill Pond, Woods Hole, *Drouet 1929*, 25 Aug. 1936 (D, F); on Zostera in Eel Pond, *Drouet 1014*, 15 July 1930 (D).

LYNGBYA LUTEA (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16**: 141, pl. iii, f. 12, 13 (1892); Collins, Phyc. Bor.-Amer. **32**: 1611 (1910), in minor part. *L. tenerrima* Born. ex Gom. *pro synon.*, loc. cit. (1892); Thur. ms. in Farlow, Mar. Alg. New Engl., 35 (1891), sec. specim. authent. in Herb. Farlow.—Our material is very similar to that distributed from Herb. Thuret in the Farlow Herbarium: FRANCE: Biarritz, *No. 55*, 10 juin 1870. This species is found in situations similar to those in which *L. confervoides* and *L. semiplena* are found; it is easily distinguished from the two latter species by the smaller trichomatal size and the reaction of the sheath to chlor-zinc-iodine. The filaments referred to as *L. lutea* in Phyc. Bor.-Amer. 1611 are few and very doubtful. Specimens seen: EASTHAM: 'Sunken Meadow,' *F. S. Collins*, 13 Sept. 1909 (Phyc. Bor.-Amer. 1611, in minor part, *specim. manca*, W, T, Y). FALMOUTH: on rocks at outlet of Oyster and Chara Ponds into Vineyard Sound, *Drouet 2172*, 29 Aug. 1937 (D, F, N, S); in drain of Supply Department Building, Woods Hole, *Drouet 1913*, 13 Aug. 1936 (D, F, S, T, Y); on pilings, Penzance Garage, Woods Hole, *G. J. Hollenberg*, 27 July 1934 (D).

LYNGBYA OCHRACEA (Kütz.) Thur. ex Gom., Ann. Sci. nat. VII Bot. **16**: 149 (1892). Authentic material: Rabenh. Alg. 58 (F), 2333 (F).—Observed in varying abundance in freshwater pools, etc. See Geitler, Rabenh. Kryptogamen-Fl. **14**: 1050 (1932). Specimens seen: FALMOUTH: in pool across road from entrance to Cedar Swamp, Woods Hole, *Drouet 1957*, 15 Sept. 1936 (D, F, S, T, Y). GOSNOLD: in spring water flowing into Cuttyhunk Pond, Cuttyhunk Island, *Drouet 2120*, 3 Aug. 1937 (D, F, N, S).

SYMPLOCA Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 104 (1892). —The fascicles of filaments produced on the surface of the plant mass in this genus are not always macroscopically visible. Perhaps in the majority of collections the fascicles are microscopic bundles of filaments either standing upright or closely appressed to the surface of the stratum. If the plant-mass has developed entirely beneath the surface of the water, it is improbable that fascicles will be formed at all; they are recognized only after the mass has developed, at least for a certain period of time, under subaerial conditions.

KEY TO SPECIES

I. Plants of salt or brackish habitats
   A. Plant-mass blackish-green, fasciculate-caespitose; fascicles erect, to 1 cm. high; filaments apparently unbranched, very closely intricated, often angulose-tortuose; sheaths thin, firm, coloring blue when treated with chlor-zinc-iodine; trichomes yellowish-green or

blue-green, 4–6 μ in diameter, always constricted at the cross-walls; cells usually quadrate or shorter than wide; protoplasm scarcely granulose; cross-walls pellucid, never granulated; outer membrane of the apical cell thickened into a depressed-conical calyptra..... *S. atlantica*

B. Plant-mass dirty green, rarely bluish-black, fasciculate-caespitose; fascicles to 3 cm. high, erect, spiniform, often discolored below because of empty sheaths; filaments compactly interwoven, somewhat agglutinated, here and there falsely branched, variously angulose-tortuose; sheaths thin, somewhat mucous, not readily coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, 6–14 μ in diameter, often torulose at the apices; cells somewhat longer than the diameter or (in broader trichomes) half as long as wide, 5–14 μ long; protoplasm granulose, cross-walls often granulated; apical cell slightly inflated, without calyptra.... *S. hydnoides*

1. Trichomes 6–8 μ in diameter, cells as long as or longer than wide..... var. *genuina*
2. Trichomes 8–14 μ in diameter, cells subquadrate to half as long as wide..... var. *fasciculata*

II. Plants of fresh, not of salt or brackish, habitats

A. Plant-mass blackish-blue-green, expanded; fascicles spiniform, to 2 mm. high; filaments unbranched, at the base contorted and irregularly interwoven, in the fascicles more or less parallel and agglutinated; sheaths firm, thin, somewhat mucous, coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, never constricted at the cross-walls, slightly attenuated at the apices, 3.4–4 μ in diameter; cells subquadrate or somewhat longer or shorter than wide, 1.5–5.5 μ long; cross-walls conspicuous, never granulated; apical cell obtuse-conical, without calyptra..... *S. muralis*

B. Plant-mass blue-green, grayish, brown, or blackish, phormidioid or fasciculate, sometimes giving a cottony appearance on damp ground; fascicles tortuous, repent, rarely erect; filaments seldom branched, tortuous, much entangled in the basal stratum, in the fascicles less tortuous and often subparallel; sheaths firm or sometimes mucous, coloring blue when treated with chlor-zinc-iodine, up to 2 μ in thickness; trichomes blue-green or olive-green, never constricted at the cross-walls, 5–8 μ in diameter; cells subquadrate to twice as long as wide, 5–11 μ long; protoplasm coarsely granulose; cross-walls not conspicuous, never granulated; apical cell rounded or obtusely conical, the outer membrane slightly thickened..... *S. Muscorum*

Symploca atlantica Gom., Ann. Sci. nat. VII Bot. **16**: 109, pl. ii, f. 5 (1892). *Lyngbya semiplena* of Davis, Bull. U. S. Bur. Fish. 1911 (2): 798 (1913), not J. Ag. ex Gom. *S. Muscorum* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 19 (1935), not Gom.—This is an inhabitant of wood and rock walls sometimes washed by waves. Our material has the short articulations and the depressed-conical calyptras of the European plant and is not to be confused with *S. funicularis* Setch. & Gardn., Univ. Calif. Publ. Bot. **6**: 469 (1918), as

distributed under the name *S. atlantica* in Phyc. Bor.-Amer. 1356. Material from my collection *1922* cited below has been compared with authentic specimens by Prof. Frémy. *S. atlantica* may sometimes be confused with *Phormidium submembranaceum*, which often is collected also on rocks and woodwork washed by waves. Specimens seen: FALMOUTH: subaerial on floating wooden piers beside U. S. Lighthouse Service Building, Woods Hole, *Drouet 1922*, 20 Aug. 1936 (D, F, S, T, Y, Frémy); Eel Pond, Woods Hole, *F. S. Collins*, 16 Aug. 1904 (sub. nom. *Lyngbya semiplena*, etc., F); subaerial at high tide mark on concrete walls of Supply Department Building, Woods Hole, *Drouet 1914*, 13 Aug. 1936 (D); subaerial, Gardiner's Ditch, Woods Hole, *Drouet 1015*, 20 July 1930 (*specim. mancum*, D).

SYMPLOCA HYDNOIDES Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 106, pl. ii, f. 1–4 (1892); Collins, RHODORA **2**: 42 (1900). *Phormidium pulvinatum* Collins[1] in Britton & Millspaugh, Bahaman Fl., 621 (1920), not Woronich. Authentic material: Desmaz., Pl. cryptog. France, éd. I, 1972 (F).—The var. GENUINA Gom. is seen mixed with other Myxophyceae in intertidal zones and salt marshes, the var. FASCICULATA (Kütz.) Gom. on larger algae in quiet salt water. Specimens seen: FALMOUTH: Menauhant, *F. S. Collins*, July 1882 (N). GOSNOLD: on mud among Spartina roots, Naushon Island, *W. A. Setchell*, 16 July 1891 (sub. nom. *S. fasciculata*, N); Hadley Harbor, Naushon Island, *W. R. Taylor*, 11 July 1931 (T, D), *Anon.*, 12 July 1931 (Herb. G. W. Prescott), *C. M. Palmer*, 28 Aug. 1937 (D, N, S).

SYMPLOCA MURALIS Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 112, pl. ii, f. 10 (1892); Setchell, Bull. Torr. Bot. Club **22**: 429 (1895); Croasdale, Fresh Water Alg. Woods Hole, Mass., 19 (1935). Authentic material: Rabenh. Alg. 142 (F), 293 (F).—Apparently not uncommon in the region on moist soil and among mosses. In rapidly growing plant masses, the cells are often somewhat longer than wide. Where the fascicles are not well developed, masses may be difficult to distinguish from those of *Phormidium Corium* and *P. papyraceum*. Specimens seen: FALMOUTH: on the ground around the railroad well, Wood's Holl, *W. G. Farlow*, Aug. 1876 (F, P); on ground near a pump, East Falmouth, *W. A. Setchell 340*, 12 July 1891 (D, duplicate of specimen in Herb. Univ. Calif., obligingly sent to me by Prof. Setchell); sandy path, Woods Hole, *Collins 5150*, 16 Aug. 1904 (sub. nom. *S. Muscorum*, N); earth, Quisset Road, *W. R. Taylor*, 9 July 1922 (T). FAIRHAVEN: on wet soil among rocks, Sconticut Point, *Drouet 2174*, 1 Sept. 1937 (D, F, S, N, T).

SYMPLOCA MUSCORUM (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16**: 110, pl. ii, f. 9 (1892); not of Croasdale, Fresh Water Alg. Woods

[1] The TYPE material of *P. pulvinatum* Collins, BAHAMA ISLANDS: Cockburn Harbor, South Caicos, *M. A. Howe 5593*, 16 Dec. 1907, in Herb. New York Bot. Gard., differs in no respect from the authentic material of *S. hydnoides* cited here. *P. pulvinatum* Woronich. is now more properly designated *P. Woronichinii* J. DeToni, *Noterelle di nomencl. algol. I. Alcuni casi di omonimia* (*Missoficee*), 7 (1934).

Hole, Mass., 19 (1935). *Phormidium Retzii* of Croasdale, ibid. 20 (1935), not Gom. Authentic material: Rabenh. Alg. 244 (F), 929 (T). —Frequently seen on moist soil in depressions and in greenhouses, sometimes among other submersed algae in ponds. Plant-masses having the described characters of f. *genuina* Gom. apud Frémy and f. *inundata* Gom. apud Frémy, Mém. Soc. nat. Sci. nat. & math. Cherbourg **41:** 83 (1934), are collected in the Woods Hole region; but material of both forms appears to develop fascicles in exactly the same manner when transferred to the laboratory and grown under subaerial conditions. Specimens seen: MASHPEE: in John Pond, *C. M. Palmer*, Sept. 1937 (D). FALMOUTH: on soil in greenhouse near railroad station, Falmouth, *Drouet 1933*, 29 Aug. 1936 (D, F); on soil in a pasture, Sippewisset, *Drouet 1935*, 4 Sept. 1936 (D, F, S, T, Y); on soil in a depression east of Iron Pond, Woods Hole, *Drouet 1938*, 12 Sept. 1936 (D, T); in spring north of Nobska Point, *C. M. Palmer*, Sept. 1937 (D). GOSNOLD: freshwater pond, Pasque Island, *H. Croasdale*, 26 June 1934 (D); Pink Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D).

(*To be continued*)

WESTERN EXTENSION OF THE RANGE OF PINUS BANKSIANA IN NEW YORK

W. F. Pratt and E. W. Littlefield

For the past thirty years or more the known distribution of *Pinus Banksiana* in New York has been confined to certain portions of the Lake Champlain watershed in Clinton and Essex counties. No stations have been reported, during this time, which would materially extend the range as outlined by the early observations of Sears[1] and Peck.[2] House[3] lists *Pinus Banksiana* as "rare" in northern New York, citing the stations reported by Peck in the Ausable and Bouquet valleys. The junior writer[4] described the association of this species with *Pinus rigida* Mill. at Clintonville, Essex County, and has noted its occurrence in a number of other unreported localities, all however, within the general limits of the range as indicated above.

In the summer of 1931, the senior writer discovered a group of *Pinus Banksiana* growing on a sandy knoll along the east bank of the Deer River in the Town of Brasher in eastern St. Lawrence County,

[1] Bull. Essex Inst. 13 (1881) pp. 174–178.
[2] N. Y. State Museum Vol. V. No. 25 (1898)
[3] N. Y. State Museum No. 254 (1924).
[4] Littlefield: Rhodora xxx (1928) pp. 129–131

within a mile of the Brasher Iron Works. Although this was reported to the junior writer at the time, the latter did not have an opportunity to visit the locality until the past October, when more detailed observations were made by both writers.

The trees in question comprise a stand of about 30 individuals, of which the largest is now thirty feet high, 7.2 inches in diameter at breast height and approximately 25 years old. The majority of the trees appear to be of about the same age and evidently became established here following a burn. A number of scattered trees are to be found east of the main group to a distance of 600 feet. Other species in mixture with the jack pines are *Populus tremuloides* Michx., *P. grandidentata* Michx., and *Betula populifolia* Marsh.

The soil here is the excessively acid Saugatuck fine sand, a feature not surprising in view of the well-known preferences of *Pinus Banksiana* in this respect.[1] Located seven miles from the St. Lawrence River at an elevation of 240 feet above sea level, this formation is typical of the deposits found in northwestern New York within the former limits of the glacial Lake Iroquois.

The isolated position of this station with respect to the previously reported occurrence of *Pinus Banksiana* in New York will be noted by the fact that it lies approximately 50 miles to the west and northwest, respectively, from the nearest stations in Clinton and Essex counties, viz., Altona and Wilmington. No occurrence of the species has been reported in Franklin County, or further westward in the state.

The station appears to be equally isolated as regards the adjacent portions of Canada since *Pinus Banksiana* is virtually absent from southern Quebec,[2] (the outlier at Rigaud is probably the only station within 50 miles of the international boundary in this region), and does not approach the St. Lawrence River in Ontario[3, 4].

Conservation Department,
Albany, N. Y.

[1] Fernald: Rhodora xxi (1919) pp. 41–67.

[2] Marie-Victorin: Les Gymnospermes de Québec. Contr. du Lab. de Bot. de Univ. de Montréal No. 10 (1927).

[3] Drummond: Canad. Nat. n. s. III (1866–68) pp. 161–167.

[4] Zavitz: Forests and Forestry in Ontario in Special Rept. to Brit. Emp. For. Conf., Ottawa (1923) p. 7.

A NEW TRIODIA FROM OKLAHOMA

H. I. Featherly

On October 22, 1937, Mr. A. E. Wade of the Soil Conservation Service brought in to the author a number of grass samples. One of these was recognized as a new grass for Oklahoma and further study proved it to be an undescribed species. The specimens of this new grass were taken from a patch found growing about 5 miles west and 3 miles north of Stillwater, Oklahoma, in a moist silt loam meadow. Mr. Ray Penn, who is engaged in range survey work in the state and who examined the specimens, has since found it growing near Collinsville, Oklahoma. There is no known distribution of the plant outside the state.

Triodia **oklahomensis** sp. nov. Culmi erecti, cristati, 12–15 dm. alti; rami floriferi vel inclusi vel exserti ex nodis mediis orientes; panicula terminali angusta 20–35 cm. longa; vaginae laxae carinatae; laminae glabrae, usque ad 12 mm. latae, usque ad 6 dm. longae a vaginis superioribus post maturitatem deciduae; panicula vel paulum exserta vel inferne inclusa, angusta, purpurea, aliquantulum viscida, ramis longis, appressis; spiculae breviter pedicellatae, 6–8 mm. longae, 4 mm. latae, constantes 7–9-flores; glumae circiter 4 mm. longae, paene aequales.

Stems erect, tufted, 12 to 15 dm. tall, with either included or exserted panicle-bearing branches from the middle nodes, and a narrow terminal panicle 20 to 35 cm. long; sheaths loose, keeled; blades smooth, variable in width up to 12 mm. and in length up to 6 dm., falling freely from upper sheaths after maturity; panicle short exserted or included at the base, narrow, purplish, more or less viscid, branches long, appressed-ascending; spikelets short pediceled, 6 to 8 mm. long, 4 mm. wide, 7 to 9 flowered; glumes about 4 mm. long, nearly equal.

The type is in the U. S. National Herbarium, collected in a moist silt loam meadow, about 5 miles west and 3 miles north of Stillwater, Oklahoma, October 22, 1937, by A. E. Wade. Co-types are deposited in Missouri Botanical Garden, St. Louis, Mo., and in Oklahoma A. and M. College Herbarium, Stillwater, Oklahoma.

This species is distinct enough to be recognized from other species of the genus at quite a distance in the field. Its closest relative is perhaps *T. flava* (L.) Smyth. which it resembles in having a purple, more or less viscid panicle. It is similar in size and is found in the same kind of habitat. It differs in having panicle-bearing branches

from the middle nodes, a slender panicle with long appressed branches and short pediceled open spikelets.

In Hitchcock's Manual of the Grasses of the United States this species keys out to *T. flava*, but the differences mentioned above enables one to separate them easily.

The writer wishes to express here his appreciation to Mrs. Agnes Chase, of the National Herbarium, for generous assistance in checking this plant with National Herbarium specimens.

Oklahoma Agricultural and Mechanical College,
Stillwater, Oklahoma.

Regulations Concerning the Gaspesian National Park.—The following regulations have been adopted by Order in Council, respecting the Gaspesian National Park:

Pursuant to article 9 of chapter 47 of the Statute 1, George VI, concerning the Gaspesian National Park,

That it be prohibited:

a) To hunt, in any manner whatsoever, the animals which are within the limits of the said park;

b) To have in one's possession, within the limits of the park, hunting implements of any nature whatsoever;

c) To enter the limits of the park without a special permit from the superintendent or the person named for such purposes;

d) To gather wild plants for any purposes whatsoever, without a written authorization from the Superintendent of the Park.—L. A. Richard, Deputy Minister of Mines and Fisheries, Province of Quebec.

For permits and further information botanists planning to visit the Shickshock Mountains should apply to Superintendent of the Gaspesian National Park, Department of Mines and Fisheries, Quebec.

FURTHER NOTE ON VERBENA STRICTA FORMA ALBIFLORA

Harry V. Truman

In the summer of 1934 the writer observed a very few plants of *Verbena stricta* Vent. forma *albiflora* Wadmond[1] scattered in a patch of the typical purple-flowered form of *V. stricta* in a pasture about two miles east of Rockton, Illinois, and several miles to the west of the

[1] Rhodora, xxxiv. 19 (1932).

station reported by Wadmond[1] in 1932. Continued observation of the colony during the summers of 1935 and 1936 revealed the fact that the white-flowered form was increasing in numbers and spreading to the adjacent roadside. In 1937 it was noted that not only had this form increased in its importance in the original station, but also that several specimens had appeared in a farmyard a half mile distant. Members of the family living upon the farm where the white-flowered form was first noted remember that in 1933 the station consisted entirely of purple-flowered plants. This observation is not reliable, however, for in 1934 the relative number of white-flowered plants was so small as to be evident only to a practised observer.

This form differs from the typical *V. stricta* not only in that its flowers are pure white, but also that its stems completely lack the purple color that is invariably characteristic of the purple-flowered form. These differences seem to indicate that some change has taken place in the genetic make-up of the plant to inhibit the development of the pigment, presumably anthocyanin, which gives the typical form its color. In all other respects the white-flowered form resembles the typical, although in a dozen specimens tagged at random early in the season and collected near the end of the flowering period for the purpose of obtaining seeds, the white-flowered plants were all notably taller, sturdier plants than the purple-flowered. This difference may have been purely accidental. At no time in the four years during which this station has come under the observation of the writer has there appeared any intermediate form. All individuals have been either typical *V. stricta*, or pure white. It is interesting to note here that this lack of intermediates has been observed by Benke[3] where *V. stricta* Vent. forma *rosciflora* Benke grows with typical *V. stricta*. A rather careful reconnaissance of the locale of the Wadmond collections failed to reveal any plants of the white-flowered form remaining in 1937.—Northern Montana College, Havre, Montana.

NORTHEASTWARD EXTENSIONS IN THE MAINE FLORA—II

George B. Rossbach

Potentilla canadensis L. is represented only locally northward and eastward into the state of Maine. Potentilla simplex Michx.,

[1] S. C. Wadmond, personal communication.
[2] Rhodora, xxxiv. 10 (1932).

and more especially its variety CALVESCENS Fernald, are well known in the state, and the latter very common through Maine and into Canada.

It is of some note, however, that P. CANADENSIS L. should be found as far northeast as Rockport, Knox County, Maine. A collection was taken from open land, in grass-turf, southwest side of Lilly Pond, May 19, 1937, *G. B. Rossbach.* Other stations in Maine, recorded from collections of the New England Botanical Club and Gray Herbarium, are as follows: sandy railroad embankment, Topsham, Sagadahoc Co., May 6, 1898, *E. B. Chamberlain*, no. 556; old cemetery, Bath, Sagadahoc Co., June 3, 1913, *Kate Furbish;* Brunswick, Cumberland Co., July 25, 1901, May 25, 1912, *Kate Furbish;* Cape Porpoise, York Co., May 25, 1895, *M. L. Fernald;* North Berwick, May 1892, and 1893, *J. C. Parlin;* South Berwick, June 13 and 14, 1896, *J. C. Parlin & M. L. Fernald.* The species has been fairly well collected from southern New Hampshire. There is one isolated collection from dry gravelly barrens and fields, Shelburne, Shelburne Co., Nova Scotia, *M. L. Fernald*, no. 2553.

The more isolated northeastern localities from which P. CANADENSIS has been collected are, so far as ascertained, areas made suitably clear, or even barren, for the growth of the plant by continued human activity. It is possible that northeast of York Co., Maine *P. canadensis* may be introduced.

The station at Lilly Pond, Rockport, is an old field, in an area cleared and partially quarried, as well as farmed, in the early history of Rockport.

PANAX TRIFOLIUM L., well represented northeastward into southern New Hampshire, becomes more and more local on into Maine.

In Gray Herbarium is one collection from as far northeast as Prince Edward Island: rich deciduous woods, Harmony, Kings Co., July 7, 1914, *M. L. Fernald & Harold St. John*, no. 11138.

But neither the Gray nor the New England Botanical Club Herbaria at Harvard contain any specimens from Maine northeast of East Mercer, Somerset Co., where the plant was collected by *Abbie E. Packard* (no date or number). East Mercer is in the valley of the Kennebec, about five miles from that river, and the other localities in the state are in the same drainage or some others to the southwest.

On May 17, 1937 the writer came upon a small patch of PANAX TRIFOLIUM in a rich hollow in heavy mixed woods near Pitcher Pond, Northport, Waldo Co.

Mr. *Thomas Ripley*, a local botanist of Lincolnville, Maine, has shown me specimens of *Panax trifolium* which he collected several years ago in a rich woodland near Lake Megunticook, Lincolnville, Waldo Co.

Bidens comosa (Gray) Wiegand appears, in herbaria, to be very local in Maine. It has been collected from a damp field, Orono, Penobscot Co., Sept. 19, 1889, by *M. L. Fernald*, and the specimen is in the herbarium of the New England Botanical Club. In recent years it was collected by the writer from boggy woods near Ducktrap River, Lincolnville, Waldo Co. This seeming rarity of Bidens comosa in this region may, of course, be due to poor representation of the species in herbaria.

Collections made by the writer and referred to in this article are to be found in the herbarium of the New England Botanical Club.

Dudley Herbarium,
Stanford University.

Wherry's Guide to the Ferns of the central Atlantic States.[1]—Dr. Wherry has probably a wider field knowledge of the ferns of eastern North America than anyone else now living. It is therefore good news that some of this knowledge has been made conveniently available to the public, even in the severely limited space of a pocket manual, covering only the states from New Jersey and Pennsylvania to Virginia.

Brevity has plainly been a controlling consideration in the preparation of the book. Descriptions are rigidly confined to a single page; the index has likewise been cut to one, rather confusingly arranged, page; and only the rudiments of a key have been admitted. But the author has contrived to include an ample, original and, for the layman, most helpful glossary of technical terms; essential synonymy, given intelligibility for the beginner by being thrown into narrative form; descriptions giving characters which, though not always technically the most important, are diagnostic and contrasting; and detailed and accurate statements of ranges and habitats such as have not appeared in previous popular works. In addition, supplementary chapters give good advice as to the cultivation of ferns and the sort of soils and other conditions needed by a considerable list of species.

Except in *Isoetes*, where they all look alike, each species is illustrated by a habit-sketch and drawings of details, placed on the page opposite the description. In the absence of a key, these illustrations are the primary means of making determinations. Not all of them are equal to this function: though many show an excellent faculty for catching the characteristic posture of the plants concerned and are otherwise clearly and skillfully done, some are stiff and conventionalized to the point of misrepresentation. I doubt if the average user, standing before a lush clump of Christmas fern in the woods, would suspect it to be the same as the attenuated design which does duty for it in the book. High magnification would be needed to reveal in the minute glandularity of *Woodsia obtusa* and *W. scopulina* anything resembling the

[1] Wherry, Edgar T. Guide to Eastern Ferns. Science Press Printing Co., Lancaster, Pennsylvania. [Dec.] 1937, 220 pp., 96 ill. $1.00

relatively huge spike-like processes figured for those species. In the latter, moreover, the glandularity of stipe and rachis is also badly exaggerated and the characteristic long hairs are altogether missing in the enlarged pinnule. The pinnule drawn under *Dryopteris cristata* belongs to some other species, probably *D. spinulosa;* and whatever the sheath ascribed to *Equisetum variegatum* may be, it is not of that species.

Because the illustrations take the place of a key, these imperfections in detail are more important than they would otherwise be. Even so, they should not obscure the fact that this little book shares with Dr. Small's "Ferns of the Vicinity of New York" the advantage of having been written by a competent professional; it carries a correspondingly greater authority and reliability than most popular fern books, and it should lead the beginner and the layman in an essentially right direction.—C. A. Weatherby.

Extension of the Range of Ranunculus Pursh.—On July 21, 1937 *Ranunculus Purshii* Richardson was found growing on a muddy hummock in Gott Brook, Springfield, Penobscot County, Maine. Some of the plants extended into the water while others were growing, at that time, above the water-level. This station is situated a few hundred yards north of where Gott Brook crosses the main road leading from Lee to Springfield.

Previous to this time the most southerly station for Maine, and also the most southeasterly station for North America was in New Limerick, Aroostook County.[1]

Mr. E. C. Ogden of the Gray Herbarium has very kindly verified the determination as made by the writer. A specimen from this station has been deposited in the Herbarium of the New England Botanical Club.—Maynard W. Quimby, University of Maine, Orono, Maine.

[1] Fernald and Wiegand, Rhodora, xii. 139 (1910).

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